Please amend claims 11, 19 and 26 to read as follows:

11. (Amended) The forged part of claim 7 which exhibits an improved T6 fracture toughness greater than 21 ksi √in.

19. (Amended) The wheel of claim 12 which exhibits an improved T6 fracture toughness greater than 21 ksi √in.

26. (Amended) The brake component of claim 20 which exhibits an improved T6 fracture toughness greater than 21 ksi √in.

Remarks

Claims 11, 19, and 26 stand rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to distinctly claim the subject matter of Applicants' invention. Claims 1-7 and 11 stand rejected under 35 U.S.C. 102(b) as being anticipated by "Metals Handbook Desk Edition" pp 426-427, 449-450 (hereinafter "Metals Handbook"). Claims 8-27 stand rejected under 35 U.S.C. 103(a) for obviousness over Metals Handbook alone or in combination with Karabin U.S. Patent No. 5,879,475 (hereinafter "Karabin").

Claims 11, 19 and 26 - 35 U.S.C. §112

In response to the Examiner's above-mentioned rejections, Applicants have amended claims 11, 19 and 26 to specify a more specific fracture toughness in accordance with the Examiner's request. Support for the amendment is found on page 7 of Applicants' specification.

Claims 1-7 and 11 - 35 U.S.C. §102

In response to the Examiner's rejection of Claims 1-7 and 11 as being anticipated by Metals Handbook, Applicants strongly disagree with the Examiner's classification of Applicants' invention as unpatentable in view of overlapping ranges. The aluminum alloy field is replete with examples of alloys classified within the same family group that share almost identical chemical compositions, yet are completely distinct with respect to properties and marketable uses. In *most* instances, these distinctions have been patent protected.

Applicant fully appreciates the Examiner's understanding on page 4 of the Office Action that aluminum alloys AA2014 and AA2214 are both members of the 2014 family of alloys that share overlapping compositional ranges. Yet, 2014 and 2214 are clearly distinct alloys. AA2214 is a higher purity version of the 2014 family and comprises only about one-half of the iron content of AA2014. So too, Applicants' invention is a distinct alloy within the 2014 family that exhibits different properties with distinct commercial uses apart from other 2014 alloy family members.

Applicants' invention is an even higher purity version than 2214, from the same 2014 family. The composition of this invention comprises only about one-half the iron content of AA2214. Paragraph 0008 of Applicants' application states:

> "The essence of this inventions' compositional change, over **both 2014 and 2214** aluminum, is: 1) a reduction in the amount of Fe present, by purposefully reducing the iron contents thereof; and 2) a purposeful tightening of the compositional range limits for this alloy's other main alloying components. In this "higher purity" state, noticeable improvements to blistering resistance and, hence, significantly lower scrap rates are achievable, at commercial production levels. In addition, greater fracture toughness performance has been observed." (emphasis added)

The higher purity alloy of Applicants' invention achieves higher tensile elongation, reduced susceptibility to high temperature oxidation and an increased fracture

toughness when compared to other alloys in the 2014 family. Paragraph 0015 of Applicants' application states:

> "In a series of experiments involving variations of alloy 2014 (Aluminum Association designation), the composition was purposefully adjusted with the intent of improving tensile elongation performance. From those experiments, it was also observed that forgings manufactured from newly cast alloy compositions had an unusually low occurrence of HTO." (emphasis added)

vague not clear

It is clear from the specification that the improved properties of Applicants' composition are distinguished not only from the 2014 alloy, but also from the other known variation of 2014, namely AA2214. Even though Applicants' invention shares some overlapping compositional ranges with other members of the 2014 family, Applicants' narrower composition exhibits unexpected properties that are not characteristic of the other alloy family members. Myriad other alloys have been produced and patented that share overlapping compositional ranges but specify narrower ranges and/or higher purity forms to achieve certain property improvements. See, for example, the overlapping ranges of AA2024 alloy family members at page 427 of the Metals Handbook (copy attached as Exhibit A). The same can be said of 7050 alloy family members as well.

The lower occurrences of blistering and surface defects exhibited by Applicants' alloy are unexpected properties that are not common to other alloys in the 2014 family. As such, Applicants' alloy is distinct from, and not anticipated by, other 2014 family alloys. ← allegedly

Claims 8-27 - 35 U.S.C. §103(a)

Applicant respectfully asserts that Claims 8-27 are non-obvious in view of Metals Handbook and/or Karabin. Applicants' alloy optimizes the compositional ranges of the 2014 alloy family in such a way as to yield unexpectedly good tensile elongation, blister resistance and fracture toughness properties.

The courts have acknowledged that a prima facie case of obviousness can be rebutted if the applicant can establish the existence of unexpected properties in the claimed range. *In re Geisler*, 43 USPQ 2d 1362 (CAFC 1997). "One way for a patent applicant to rebut a prima facie case of obviousness is to make a showing of 'unexpected results,' i.e., to show that the claimed invention exhibits some superior property or advantage that a person of ordinary skill in the relevant art would have found surprising or unexpected." *In re Soni*, 34 USPQ 2d 1684, (Fed. Cir. 1995). If the "results of optimizing a variable" are "unexpectedly good" then a patent can be obtained for the claimed critical range. *In re Antonie*, 195 USPQ 6 (CCPA 1977); *In re Dillon*, 16 USPQ 2d 1897 (Fed. Cir. 1990) (in banc).

Applicants' alloy exhibits unusually little "high temperature oxidation" (HTO). The other alloys of the 2014 family exhibit pores and blisters (associated with HTO) that need to be removed from the surface by grinding and machining operations. Such additional steps are both costly and time consuming. In some instances, the porosity in 2014 family alloys is so extensive that parts must be scraped entirely. Paragraph 0018 of Applicants' application states:

> "Prior to the adoption of this new alloy composition, scrap rates in the manufacture of aircraft wheels from 2014 aluminum AVERAGED 16% per year for the previous 3 years. In addition to lost wheels, too far damaged to recover by rework, there were others which while not so far damaged as to require scrapping, nevertheless required additional processing steps (including sanding, repolishing) prior to release to the ultimate consumer of such goods. Through the manufacture of these more HTO-susceptible parts from the alloy composition of this invention, scrap rates are now running at 0%."

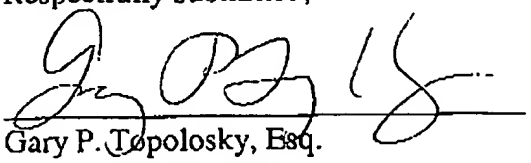
Applicants' alloy has virtually eliminated a significant cost and processing problem associated with the 2014 alloy family. The intentional reduction of the iron content of Applicants' alloy and tighter controls over the instant alloy's other main alloying ranges have resulted in an entirely unexpected surface behavior. Accordingly, the benefits of Applicants' alloy are clearly non-obvious over the cited Metals Handbook and since other 2014 alloy family members exhibit costly surface defects that are not present with Applicants' invention.

The commonly assigned Karabin patent discloses an entirely different alloy based on a significantly higher Cu:Mg ratio and a drastically lower silicon composition. Karabin's composition also contains silver as a **mandatory** element. Particularly, Karabin discloses a composition comprising up to about 0.1 wt.% silicon, 4.85–5.3 wt.% copper, 0.4-0.8 wt.% manganese, 0.5-1.0 wt.% magnesium, and 0.2-0.8 wt.% silver with a Cu:Mg ratio between 5 and 9. By contrast, Applicants' invention alloy is silver-free, comprises 6 to 9 times the silicon of Karabin and has a Cu:Mg ratio between 8 and 11. Although the Karabin alloy *can* be forged into aircraft wheels or brake forms, its composition is so dramatically different from Applicants' alloy that the Karabin reference alone, or in combination with Metals Handbook still cannot be said to teach or make obvious the alloy of Applicants' invention.

For all the foregoing reasons, it is respectfully submitted that the amended claims of this invention are distinguishable over the cited art of record, both Metals Handbook and Karabin and any lawful combinations of these two references. As amended above, all claims of this application should be in condition for allowance. Nevertheless, if the Examiner would like to suggest changes of a more formal nature to place this application in better condition for allowance, a telephone call to Applicants'

undersigned attorney would be appreciated. Review, reconsideration and withdrawal of the rejections to this application are respectfully requested.

Respectfully submitted,



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Marked Specification Paragraphs

[0010] FIGURE 1 is a copy of a photograph of [a]two forged parts: one made from the invention alloy (left), versus [the same]a second part made from 2014 aluminum (right)[,]. The original photograph of these parts was taken under ultraviolet light [to show] with a fluorescent die, [i.e.]the speckled portions on the right forged part[, that flags] indicating areas of HTO defect or blistering on said part;

[0011] FIGURE 2 is a copy of a close-up photograph of the lower portions to the two comparative forged parts shown in the same position as in FIGURE 1, with the invention alloy part on the left and 2014 forging on the right; and

[0012] FIGURES 3A and B compare [is a]side-by-side [comparison] copies of two computer generated micrographs (at 500x magnification) of sections [to both]for the parts of [FIGURE 1]FIGURES 1 and 2, but with the relative positions of these two parts reversed, i.e., FIGURE 3A represents the 2014 forged part and FIGURE 3B the invention alloy.

Detailed Description of Preferred Embodiments

[0013] For any description of preferred alloy compositions herein, all references to percentages are by weight percent (wt.%) unless otherwise indicated. When referring to any numerical range of values, such ranges are understood to include each and every

number and/or fraction between the stated range minimum and maximum. A range of about 4-4.7 wt.% copper, for example, would expressly include all intermediate values of about 4.01%, 4.03% and 4.05% all the way up to and including 4.55%, 4.65% and 4.69% [Cui]Cu. The same rule applies to every other elemental range and/or property value set forth hereinbelow.

[0017] In order to evaluate the effect of a new alloy composition on HTO susceptibility, a comparative trial was conducted using the new alloy on a forging configuration that had historically exhibited high HTO occurrences. This particular die forging configuration, for an aircraft wheel, was manufactured using standard 2014 and the new alloy composition of this invention. After the forgings were manufactured, they were inspected using a fluorescent die penetrant per ASTM Standard No. E1417, the disclosure of which is fully incorporated by reference herein. The small blisters and surface voids characteristic of HTO, often detected using this inspection technique, also detect cracks and other objectionable surface features. These copies of photographs, FIGURES 1 and 2 below, show the same forgings made from two distinct alloy compositions. Using an ultraviolet light, the fluorescent die-laced comparative forgings clearly display how these modifications to alloy composition (from known 2014 practices) clearly show a marked improvement in performance, i.e. significantly reduced occurrences of HTO-type 'blistering", or the numerous "white spots" in the right side wheel in both FIGURES 1 and 2.

Marked Claims

11. (Amended) The forged part of claim 7 which exhibits an improved T6 fracture toughness [performance as compared to its 2014 aluminum counterpart] greater than 21 ksi √in.

19. (Amended) The wheel of claim 12 which exhibits an improved T6 fracture toughness [performance as compared to its 2014 aluminum counterpart] greater than 21 ksi √in.

26. (Amended) The brake component of claim 20 which exhibits an improved T6 fracture toughness [performance as compared to its 2014 aluminum counterpart] greater than 21 ksi √in.